2. Natural Sites to be Linked and Interpreted by the Trail

Resources of the Atlantic Coastal Plain

Much of the trail corridor is located within the Atlantic Coastal Plain, which in Pennsylvania encompasses a thin strip of land along the west bank of the Delaware River with industrial Philadelphia as its center. The Atlantic Coastal Plain in southeastern Pennsylvania is part of an extensive geologic formation that stretches from Newfoundland to Florida, and consists of a narrow band of inner coastal plain sediments, only five miles wide. This thin strip of land is host to a wide variety of plants and animals that have adapted to the coastal climate, hydrology and topography during the millions of years since its formation. In spite of its relatively small size, the coastal plain exhibits a biological diversity rivaling or exceeding that of many surrounding regions. It is a meeting ground of northern, southern, western, and eastern faunal and floral species.

The coastal plain has its own forest community known as Coastal Plain Forest, with a unique assemblage of fauna. Although not uncommon in other mid-Atlantic states of the East Coast, the plant community is one of the rarest in the state; intense urbanization along the lower Delaware River has reduced its natural range to fewer than five isolated remnants.

Coastal plain forest occurs on flat lowlands and sandy soils. Plant species that can tolerate the acidic, poorly drained soils include trees such as sweetgum (*Liquidambar styraciflua*), willow oak (*Quercus phellos*), red maple (*Acer rubrum*), American holly (*Ilex opaca*) and sweetbay magnolia (*Magnolia virginiana*). Understory vegetation includes fetterbush (*Leucothoe racemosa*), greenbrier (*Smilax rotundifolia*), and sweet pepper bush (*Clethra alnifolia*), which are found at moist forest edges.

Few naturally occurring stands of coastal plain forest remain in Pennsylvania. Several species within this ecosystem occur in Bucks and Lancaster counties, and one remnant coastal plain forest stand can be seen at the Five Mile Woods Preserve in Lower Makefield Township, Bucks County. Little Tinicum Island, adjacent to the trail corridor, is a state forest that includes 40 acres of coastal plain plant communities. The urbanization associated with the trail corridor has generally reduced, degraded or even eliminated the coastal plain forest in the Philadelphia area; however, there are opportunities to restore and interpret portions of the coastal plain forest and associated wetlands at select sites within the trail corridor. These opportunities are noted below.

Wetlands comprise the other main habitat types that dominate the Atlantic Coastal Plain. Wetland types within the trail corridor are described in more detail below.

Floodplains & Wetlands

Wetlands are the major habitat types that dominate the coastal plain. The Pennsylvania portion of the coastal plain and its wetlands are an important component of the Delaware Estuary, an internationally recognized natural resource which represents the tidal portion of the Delaware River from Trenton, New Jersey to the mouth of the Delaware Bay at Cape May, New Jersey. Estuarine zones include wetlands, which are highly productive fishing grounds, excellent filters which remove contaminants from the water, significant floodwater storage areas, and feeding areas for millions of migratory birds.

Coastal plain wetlands in the trail corridor consist of Freshwater Intertidal Mudflats and Freshwater Intertidal Marshes, the only such areas in the Commonwealth. Mudflats, such as those adjacent to Hog Island Road along the Delaware River, are partially submerged at mean low tide and few species can survive in the flats. Consequently, low-growing annuals and herbaceous perennials dominate the mudflats; species include Smith's bulrush (*Scirpus smithii*), subulate arrowhead (*Sagittaria subulata*), multiflowered mud plantain (*Heteranthera multiflora*), and little-spike spikerush (*Eleocharis parvula*), all classified as species of special concern in Pennsylvania. Other species growing in intertidal areas between mean low and mean high tide include spatterdock (*Nuphar luteum*), arrow-arum (*Peltandra virginica*), and pickerelweed (*Pontederia cordata*).

Freshwater Intertidal Marshes differ from the mudflats in abundance of permanent vegetative cover. Cattails (*typha* spp.), bulrushes (*Scirpus* spp.), and grasses predominate. Wild rice (*Zizania aquatica*), a rare species in Pennsylvania, can be found in these marshes. Eight out of twenty-one state-endangered plants occur in the coastal plain of southeastern Pennsylvania, and of those eight, at least six occur in Freshwater Intertidal Marshes or Mudflats. Three state-endangered species are known to have occurred historically in the coastal plain wetlands; however, two of the three have not been seen since the early 20th century.

Undisturbed tidal wetlands are rare within the trail corridor, and exist only within the 1,200-acre John Heinz National Wildlife Refuge. There are approximately 150 acres of relatively undisturbed marshlands located within the center of the refuge. All other march acreage has been altered by diking, dredging and/or filling. Historical records show that 40 rare intertidal and coastal plain species once existed in the area, but only 4 can be found today. An extensive system of freshwater marshes once stretched from the mouth of the Schuylkill River to the uplands of Chester County. Starting in the late 17th century, Swedish, Dutch, and English settlers diked and drained the extensive tidal freshwater marshlands surrounding Philadelphia for grazing and farmland. These modifications to the marsh ecosystem were minimal compared to the massive filling operations that occurred after World War I. Hog Island, now the location of Philadelphia International Airport, was tidal until 1914, when the island was transformed into a shipyard. The marshes of nearby Tinicum Island have been altered to accommodate rail tracks, I-95, and the airport using sumps, dikes, drains, and diversions. Now this area is the site of shipyards, bulk oil handling facilities, and various commercial and industrial activities, and little remains of the original marshland. Much of the former tidal marsh has been impounded, filled, or overgrown with the exotic species reed grass (Phragmites australis). Large areas of reed grass can be seen along portions of Hog Island Road, adjacent to the airport, and in certain portions of John Heinz NWR, where they are actively controlled to minimize their competition with native plants.

Two of the few significant freshwater tidal wetlands still in existence within the coastal zone are those associated with the John Heinz (formerly Tinicum) National Wildlife Refuge and Little Tinicum Island. The former includes some 1,200 acres of tidal wetlands, tidal lagoons, impounded wetlands, and transitional or upland areas. The latter was designated a state forest in 1983, and includes approximately 40 acres of coastal plain plant communities as well as one of the few stands of Walter's barnyard grass (*Echinochloa walteri*) extant along the Pennsylvania portion of the Delaware River. This plant is considered endangered in the Commonwealth of Pennsylvania.

In the past, wetlands like the Tinicum Marsh have often been regarded as wastelands and places to be avoided and/or eliminated by draining or filling. Recently there has been a growing awareness of the value of wetlands and their associated species. Government agencies, conservation groups, and individuals are intentionally creating and restoring wetlands, and tidal

and freshwater wetlands are now protected from unlawful encroachments such as construction, draining, filling, and obstruction of natural waterways. An example of a recent wetlands restoration project completed at Bartram's Garden is described below.

Environmental education and public awareness help promote a variety of important wetland functions. Wetlands provide critical habitats for at least seven plant species classified as state-endangered or threatened, habitats for fish and wildlife, purify polluted waters, and impede the destructive power of floods and storms. Additionally, wetlands provide recreational opportunities such as fishing, hunting, photography, and wildlife observation. Wetlands restoration projects in the trail corridor will help ensure that animal and plant species diversity and abundance which once existed along the lower Delaware River is not totally lost, and that many species can survive to allow restoration of natural areas beyond their current borders.

Along the proposed trail are several wetlands, both natural and restored, which are not currently part of a formal park or public area. With the construction of the trail, these sites could be acknowledged and signed appropriately. They can offer wonderfully scenic views of relatively undisturbed natural habitats, offer environmental education, and contribute to the preservation of the lower Schuylkill and Delaware River waterfronts.

Just south of Bartram's Garden is a Sun Company sponsored wetland pond and between Maritank tank farms and the Schuylkill River, off of 61st Street, is a 35-acre green patch of wetlands. These wonderfully green areas stand in natural contrast to the tank farms and refineries directly across the river.

About one half of a mile south of 67th Street is Harkness Point, which contains some 40 acres of woods and wetland bordering the Schuylkill River. The 40-acre site was once used as a household dumping ground and is now owned by Sun Oil Company. Many artifacts such as early 20th century bottles are close to the soil surface. The site presents an opportunity for restoration and interpretation of the forest community and wetland, provided that an environmental assessment and remediation, if necessary, is undertaken. Although cyclists and hikers could pass through and enjoy this wetland, there are significant industrial hazards and safety issues that must first be addressed.

At the Lower Schuylkill River Corridor is the Mud Island "fish hook" segment, which is over two miles long, containing long stretches of wetlands and meadows. Beyond Fort Mifflin, the Hog Island Road passes along the Delaware River one third of a mile through native wetlands, some invaded by the exotic phragmites. Routinely, many cyclists already travel this route. Hidden along portions of the riverfront at the southern end of Hog Island Road are two recreated wetlands, a cove and a land-based wetland that were part of an Philadelphia Industrial Development Corporation mitigation project. Beyond these wetlands, the proposed trail leads cyclists into the small town of Essington, one mile before entering the greatest expanse of wetlands located within the trail corridor at the John Heinz National Wildlife Refuge in Tinicum.

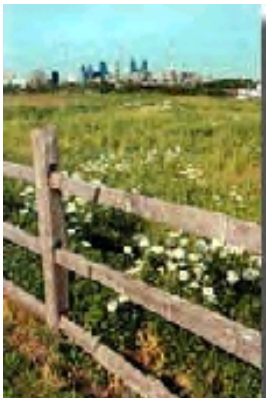
An environmental assessment would need to be conducted for those sections of trail that could potentially impact wetlands and floodplains. The USFWS Nationwide Wetlands Inventory would be consulted, as would the FEMA 100-year flood insurance maps for the trail corridor, prior to trail implementation, to identify and document locations and conditions of wetlands and floodplains. The U.S. Fish and Wildlife Service; the Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry and Natural Heritage Program; and the Pennsylvania Department of Environmental Protection, Coastal Zone Management, would be consulted to identify the potential locations of federal or state threatened, rare and endangered

species and their wetland habitats and to recommend strategies for avoiding impacts to these species and to wetlands during trail implementation.

- ***Historic Bartram's Garden***

River floodplains develop through erosion processes and through deposition of sediment during floods. As a result, wetlands form on floodplains where periodic flooding or high water tables provide sufficient moisture. These "riparian" wetlands may undergo constant change as rivers and streams form new channels and when floods scour the floodplain or deposit new material. This process is visible in the floodplain along the Schuylkill River at Bartram's Garden.

In the fall of 1997, ten thousand native wetland plants, including bullrushes, marsh grasses, irises, hibiscus, and marsh roses were planted in Bartram's re-established 1.5-acre wetland, the first interpretive and interactive wetland along the lower Schuylkill River. These wetland species were indigenous to the Schuylkill banks during John Bartram's lifetime. This new wetland has reintroduced a habitat for previously vanished wildlife that is uniquely adapted to wetland conditions, including many shorebirds. As a result, the new wetland simultaneously provides recreational activities, such as birdwatching, and improves water quality in the Schuylkill River.



In addition to experiencing the recreated tidal wetland, visitors can stroll the winding boardwalk through the floodplain along the Schuylkill River and observe the bordering wetland species such as American sweetgum, green ash, silver maple, river birch, common alder, black cherry, and black willow. At the point closest to the river, visitors can see tidal markings from the 1780s to the 1850s carved on nearby bedrock.

Upland habitat is also represented at Bartram's. During the late 1980s, Bartram's reclaimed an adjacent industrial tract as a 17-acre wildflower meadow. Native meadow grasses and wildflowers were planted by the John Bartram Association with assistance from the Philadelphia Water Department and Philadelphia Committee of the Garden Club of America. The common daisy, which inspired John Bartram's passion for the natural world, blooms abundantly in late April and early May.

As America's oldest living botanical garden, Bartram's Garden is enriched with native and exotic plant species, some of which descend from colonial plant stock. For example, the Bartrams saved the delicate *Franklinia altamaha*, named after Benjamin Franklin, from extinction. The tree was last seen in the wild in 1803. All *Franklinia* growing today are descended from those propagated and distributed by the Bartrams. One of the oldest trees in the garden, the yellowwood, may have been collected in Tennessee or Kentucky by French plant explorer Andre Michaux and sent to William Bartram in the 1790s. The male gingko tree, the oldest in

the country, is believed to be the last of three original gingkoes introduced to the United States from China. They were grown in Chinese palace gardens as early as 2000 BC.

See the Community Resources section for educational events and options, see the Historic Sites section for a description of site significance, and see the Recreational Sites Section for additional information on recreational opportunities available at the site.

- ***John Heinz National Wildlife Refuge at Tinicum***

The most significant freshwater tidal wetlands still in existence within the Pennsylvania portion of the Atlantic coastal zone are those associated with the John Heinz National Wildlife Refuge at Tinicum. The refuge includes some 1,200 acres of tidal wetlands, tidal lagoons, impounded wetlands, and transitional or upland areas. Unfortunately, the plant communities associated with remnant habitats of Tinicum Marsh have become so seriously altered that recent botanical surveys have only found 4 of the 35 species, which had been collected there in the past.

As a means of survival in the early seventeenth century, the Swedes, and later the Dutch and English, diked and drained parts of the Tinicum marshlands for grazing. The tidal marshes measured over 5,700 acres upon the arrival of Governor Printz in 1643. Urbanization swiftly reduced the marsh's acreage to about 200 acres after World War II; however, a 1972 Congressional legislation authorized the Secretary of the Interior to acquire 1,200 acres to establish the Tinicum National Environmental Center. In 1991 the marsh area was renamed in honor of the late U.S. Senator John Heinz, who helped preserve the marsh. Presently, the refuge encompasses the largest remaining freshwater tidal wetland in Pennsylvania and the largest urban wildlife refuge in the U.S. In addition, 44 acres of severely despoiled marsh have been restored as part of two wetland mitigation projects. One project included restoration associated with impacts from the "Blue Route" (I-476) to 18 acres of wetlands, and the second mitigation project included Philadelphia International Airport's new commuter runway, which impacted some 26 acres of wetlands. Approximately 170,000 cubic yards of dredge spoil was removed from the freshwater tidal marsh.

The scenic 4.5-mile segment of Darby Creek that flows through the refuge allows canoeists to see a variety of unique plants and animals. Located on Darby Creek's northern side is Hermesprota Creek, one of the larger channels. Past the marsh, the creek is bordered by the refuge to the south and the towns of Folcroft and Norwood to the north. Another large tributary, Muckinipates Creek, also enters Darby Creek. On the shores of its confluence with Darby Creek sits the historic Morton Morton House in Norwood's Winona Park. There is a canoe launch on the grounds—visitors must remember that the refuge waters are tidal and navigable only within two hours before and after high tide.

The John Heinz National Wildlife Refuge at Tinicum is presently host to over 280 species of birds. The diked 145-acre non-tidal area, consisting of open water along adjacent heavily vegetated tidal wetlands, offers a habitat for migratory waterfowl, such as Canadian geese, great blue herons, egrets, killdeer, sandpipers and a large variety of ducks. Least bitterns, great egrets, black-crowned night herons and yellow warblers are among the species which nest on or near the refuge. It is also home to hooded mergansers, pintails, shovelers and mallards and is one of a few places in Pennsylvania where the state endangered red-bellied turtle and southern leopard frog can be found.

Along with birdwatching, fishing is a recreational activity available to visitors. Fishing along the banks of the 145-acre impoundment and Darby Creek could reward visitors with carp, catfish, large-mouth bass and smaller pan fish. The fishing pier near Tinicum and Prospect Park on the west side of Route 420 accesses the lagoon areas of the refuge. The lagoon is home to striped bass, carp, catfish, panfish, and tiger musky. A "catch and release" approach is recommended within refuge grounds, based on health concerns. Eating the fish is not recommended due to the contaminated tidal waters that affect the fish. The recreational activities offered within John Heinz NWR allow visitors to study wildlife in its natural habitat on a daily basis, participate in environmental education programs, and be a part of preserving and restoring the Tinicum Marsh.

See the Community Resources section for educational events and options, and see the Recreational Sites Section for additional information on recreational opportunities available at the site.

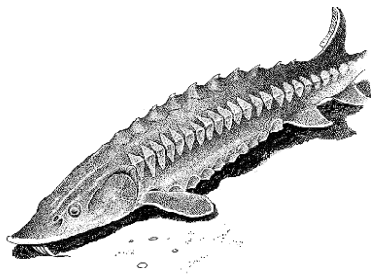
Rare, Threatened and Endangered Species

Several rare, threatened and endangered species are known to occur or have been observed within the trail corridor. Trail design and development would need to avoid impacts to habitat associated with these species, and seek opportunities to enhance and restore habitat in appropriate locations.

The **threespine stickleback** (*Gasterosteus aculeatus aculeatus*) is a spiny-finned fish found in fresh and salt water throughout many temperate and subarctic areas of the northern hemisphere. The stickleback is a scaleless fish having a rather wide mouth filled with small sharp teeth and a head protected by hard bone. The body usually is protected by a series of bony plates. Depending on the species, 2 to 15 nonconnected erectile dorsal spines are present in front of the dorsal fin. The two- or three-spined stickleback is found in Europe, northern Asia, and North America; it attains a length of about 7.5 cm (about 3 inches).

The threespine stickleback was discovered recently within a tributary of the Delaware River off of Hog Island Road, causing a redesign of the bridge along that road. The threespine stickleback is not uncommon in surrounding states but is considered endangered in Pennsylvania.

The **shortnose sturgeon** (*Acipenser brevirostrum*) has been sighted in recent years in tributaries of the lower Delaware River near the trail corridor. It has been federally listed as an endangered species since 1967.



The shortnose sturgeon is the smallest of the three sturgeon still found in Pennsylvania, seldom exceeding three feet in length. The body color is dark brown to black on top and lighter brown to yellowish below. It spawns in the coastal rivers along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida. The shortnose sturgeon is anadromous, living mainly in the slower moving riverine waters or near shore marine waters, and migrating periodically into faster moving fresh water areas to spawn. It prefers the near shore marine, estuarine and riverine habitat of large river systems. Shortnose sturgeon juveniles feed on insects and crustaceans, while molluscs and large crustaceans are the primary food of the adult. In the northern portion of the range, shortnose sturgeon are found in the Chesapeake Bay system; Delaware River from Philadelphia, Pennsylvania to Trenton, New Jersey; the Hudson River in New York; the Connecticut River; the lower Merrimack River in Massachusetts; the Piscataqua River in New Hampshire; the Kennebec River in Maine; and the St. John River in New Brunswick, Canada. Shortnose population levels have probably declined because of pollution and overfishing. Construction of dams and pollution of many large northeastern river systems during the period of industrial growth in the late 1800's and early 1900's may have resulted in substantial loss of suitable habitat. In addition, habitat alterations from discharges, dredging or disposal of material into rivers, or related development activities involving estuarine/riverine mudflats and marshes, remain constant threats. Commercial exploitation of shortnose sturgeon occurred throughout its range starting in colonial times and continued periodically into the 1950's.

The **Red-Bellied turtle** (*Crysemys/Pseudemys rubriventris*) is considered endangered in Pennsylvania, but fortunately is known to breed in the John Heinz National Wildlife Refuge at Tinicum.

Other areas of location and endangerment include Alabama and Massachusetts. They are usually active from late March to October and during the winter they rest on the bottoms of ponds under the ice in a state of relative inactivity or hibernation. When spotted, the turtles are usually seen sunning with Painted Turtles, but are almost twice the size of that species with a shell length of 10-12.5 inches. Its color varies from brown to black with a mottled pattern of reddish brown. Several vertical red bars run from the center of the shell to its outer edge.

The most important habitat feature for the turtle appears to be the presence of abundant submerged aquatic vegetation, especially milfoil, which is the preferred food of the adult turtles, although crayfish are also eaten. It seems that pond surroundings most frequently selected by nesting females are open, well-insulated, well-drained elevations at least one meter above pond level. Nests are often dug in sandy roads adjacent to ponds, or in other cleared areas. It appears that females even prefer disturbed substrates for nesting.

As early as pre-colonial times the species was used as food. Later the diking of streams and creeks for farmland probably contributed to its vulnerability to human and animal prey. Until recently the continued dredging and/or disposal of material into the area creeks, and development activities within the mudflats and marshes, altered the turtles' habitat. Similarly, in areas like Massachusetts the loss of the turtles' nesting habitat to housing development has become quite serious.

For further detailed research regarding PA Natural Diversity Inventory species located within the trail corridor contact:

Department of Conservation and Natural Resources
Bureau of Forestry
PO Box 8552
Harrisburg, PA 17105-8552
(717) 787-3444